

PATENT ABSTRACTS OF JAPAN

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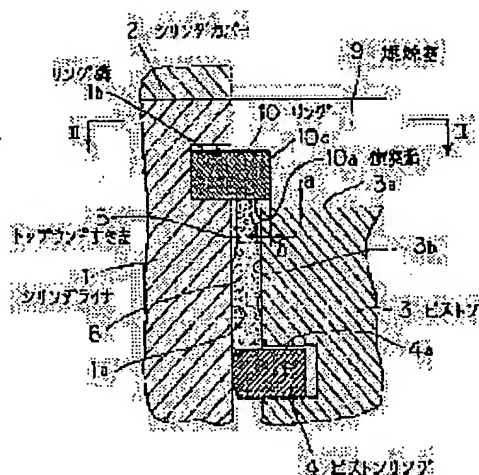
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(54) CYLINDER LINER

(57)Abstract:

PURPOSE: To reduce consumption rate of lubricant while preventing the lubricant which is in the top land clearance to be supplied to an inner periphery of a cylinder liner from rising in the direction of a combustion chamber, by providing a ring groove in a higher place than a top dead center of a piston on the inner periphery of the cylinder liner which a piston ring comes into slide contact with.

CONSTITUTION: A ring groove 1b is provided above the top dead center of a piston in a cylinder liner 1 and the lubricating oil scraped up by a reciprocating movement of a piston 3 fits a ring 10 with a collision surface 10a into the ring groove 1b. Consequently, in the vicinity of the top dead center of the piston 3, the lubricating oil 6 in a top land clearance 5 is given an upstroke by an upward inertial force of the piston 3 but the lubricating oil collides with a lower face of the ring 10 or the collision surface 10a and drops so that the scattering into a combustion chamber 9 is prevented. Therefore, the wastefully consumed lubricant oil is remarkably decreased which invades the combustion chamber 9 to be evaporated with flame.



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CLAIMS

[Claim(s)]

[Claim 1] The cylinder liner characterized by equipping with the ring which has the collision side where the lubricating oil through which establishes a ring groove in an upper part location, and it is run by reciprocation of a piston in the cylinder liner for reciprocating engines rather than the piston top dead center of inner skin where the piston ring of the above-mentioned cylinder liner ****s collides in the above-mentioned ring groove.

[Claim 2] The cylinder liner according to claim 1 which the above-mentioned ring is divided into a circumferencial direction at plurality, and it comes to attach with a spring in the above-mentioned ring groove.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the cylinder liner used for reciprocating engines, such as an internal combustion engine and a reciprocating compressor.

[0002]

[Description of the Prior Art] The sectional view of the circumference of a reciprocation internal combustion engine's combustion chamber is shown in drawing 6. In order that 01 may be a piston at which cylinder cover and 020 reciprocate an exhaust valve and 03 reciprocates the inside of a cylinder liner 01 and may carry out the seal of the combustion gas in a combustion chamber 09 to the periphery of this piston 03 a cylinder liner and 02 in drawing, two or more piston rings (this example 4) 04 are attached.

[0003] While a lubricating oil is supplied to inner skin (sliding surface) 01a of the cylinder liner 01 which ****s to the above-mentioned piston ring 04 and this by the lubrication hole (not shown) or splash oil supply drilled by the cylinder liner 01 and preventing printing of the piston ring 04, wear of sliding-surface 01a of the piston ring 04 and a cylinder liner 01 is reduced.

[0004]

[Problem(s) to be Solved by the Invention] The behavior situation of the lubricating oil 06 at the time of a piston 03 being in a top dead center is shown in drawing 7. The lubricating oil supplied to the inside of a cylinder liner 01 is stored in the top-land clearance 05 which is the space formed by the peripheral face of inner skin 01 of top-face [of the piston ring 04 of the maximum upper case], and cylinder liner 01 a, and a piston 03.

[0005] Although the above-mentioned piston 03 reciprocates the inside of a cylinder liner 01, acceleration:alpha the lubricating oil 06 which exists in the top-land clearance 05 is also indicated to be by the following formula by this is received.

[0006]

$\text{Alpha} = r \omega^2 [\cos\theta + (\cos 2\theta) / \lambda]$ (1)

Here, they are r:crank throw, omega:angular velocity, and lambda:***** ratio whenever [theta:crank angle].

[0007] The above-mentioned acceleration: Since alpha becomes max upward in a top dead center, the lubricating oil 06 in a top land 05 disperses into a combustion chamber 09 with the inertial force by this acceleration:alpha, and it adheres to the inner skin which does not **** to the piston ring 04 of top-face 03a of a piston, cylinder cover 02, and a cylinder liner 01, and it is made it is not only no longer to use for the lubrication of the sliding section of the cylinder liner 01 and the piston ring 04 which is the original purpose, but to evaporate to it with the flame generated at the time of combustion.

[0008] Therefore, the lubricating oil which disperses with the above-mentioned inertial force will be consumed vainly, and causes aggravation of specific lubricating oil consumption.

[0009] The purpose of this invention is preventing the rise to the direction of a combustion chamber of the lubricating oil supplied to cylinder liner inner skin, especially the lubricating oil in top-land clearance, and reducing specific lubricating oil consumption.

[0010]

[Means for Solving the Problem] The 1st means made into the summary of this invention is having attached the ring which has the collision side where the lubricating oil through which establishes a ring groove in an upper part location, and it is run by reciprocation of a piston rather than the piston top dead center of the inner skin of a cylinder liner collides in the above-mentioned ring groove.

[0011] Moreover, the 2nd means is having divided the above-mentioned ring into the circumferencial direction at plurality, and having attached in the ring groove with the tension of a spring.

[0012] In addition, the distance (clearance) with a piston-top surface [in / on the above-mentioned ring and / the collision side, i.e., the inferior surface of tongue of a ring and a top dead center,] is the range which does not cause trouble to the reciprocating motion of a piston. It takes as small as possible, and as for the inner skin of a ring, it is more desirable than the peripheral face of the piston upper part to bring near by movement of the combustion and piston, and exhaust valve in a combustion chamber inside in the range which does not cause trouble, and to fully take the lap section of a piston and a ring, when preventing a rise of a lubricating oil.

[0013]

[Function] [near the piston top dead center], since this invention is constituted as mentioned above, although climb motion is given to the lubricating oil between top-land clearance in connection with the upward inertial force of a piston, this lubricating oil collides and falls, the inferior surface of tongue, i.e., the collision side, of a ring, and scattering to a combustion chamber is prevented.

[0014] Moreover, since according to the 2nd means of the above a ring is strongly attached by the elasticity of a spring in a ring groove while the seal of the abutment section of a ring is performed certainly, a rise of a still higher lubricating oil and the scattering prevention effectiveness are acquired.

[0015]

[Example] With reference to a drawing, the example of this invention is explained to a detail below. The II-II view Fig. of drawing 1 R> 1 is shown for the expanded sectional view near the cylinder liner upper part of the internal combustion engine applied to the 1st example of this invention at drawing 1 in drawing 2, respectively.

[0016] In drawing 1 and 2, it is the top-land clearance where the piston at which in 1 a cylinder liner and 2 reciprocate cylinder cover and 3 reciprocates the inner skin 1a top of a cylinder liner 1, the piston ring with which two or more 4 was attached in the periphery of this piston 3, and 9 are carried out by the combustion chamber, and partition formation of 5 is carried out by inner skin 1a of a cylinder liner 1, up peripheral face 3b of a piston 3, and top-face 4a of the 1st step piston ring 4.

[0017] 10 is the ring with which it was equipped in ring groove 1b formed in inner skin 1a of a cylinder liner 1. It is equipped with this ring 10 in ring groove 1b of the cylinder liner 1 prepared in the location which does not contact piston-top-surface 3a in the location which a piston 3 stops in that top dead center.

[0018] That is, the above-mentioned ring 10 is constituted so that it may take greatly in the range which does not cause trouble to movement of combustion [in / for the amount b of laps of the inner skin 10c and peripheral face 3b of a piston / a combustion chamber 9], a piston 3 and a feed valve, and an exhaust valve, while it takes small the clearance a between inferior-surface-of-tongue (collision side) 10a of this, and piston-top-surface 3a in the top dead center location of a piston 3 in the range which does not have trouble in the reciprocating motion of a piston 3.

[0019] When removing by attaching this in ring groove 1a as shown in drawing 2 since the above-mentioned ring 10 is the integral construction which prepared one abutment clearance 10b in the circular ring, it needs to apply the force in the direction which contracts abutment clearance 10b, and needs to make a bore small. For this reason, 10d of crevices is established in the top face of a ring 10, and insertion of a fixture is enabled at 10d of this crevice.

[0020] The inertial force which acts on the lubricating oil 6 stored in the top-land clearance 5 by which partition formation was carried out at the piston ring 4, the cylinder liner 1, and piston 3 of

the maximum upper case at the time of operation of the internal combustion engine having the cylinder liner constituted as mentioned above serves as max at the time of the top dead center of a piston 3. For this reason, although this lubricating oil 6 tends to disperse to a combustion chamber 9, it collides with the inferior surface of tongue 10 of the ring 10 fitted in in ring groove 1b of a cylinder liner 1, and scattering can be prevented. by this, it infiltrates into a combustion chamber 9 and evaporates with a flame, and the lubricating oil consumed vainly is boiled markedly and decrease in number.

[0021] The 2nd example of this invention is shown in drawing 3 - drawing 5 . In this example, this is attached in the ring groove 16 of a cylinder liner 1 by the coil spring 16 using the ring 15 of the assembled die trichotomized by the circumferencial direction as a ring.

[0022] That is, in drawing 3 - drawing 5 , 15 is the ring (two division or more than quadrisection is sufficient) trichotomized by the circumferencial direction, and is attached in ring groove 1b engraved on inner skin 1a of a cylinder liner 1. 16 is a coil spring, was attached in 15f of fitting slots established in the inner skin of the above-mentioned ring 15 along with the circumferencial direction, and has pushed the ring 15 against the base of ring groove 1b by the outward elasticity (flare force).

[0023] As shown in drawing 5 , three joint 15e of the ring 15 by which trichotomy was carried out [above-mentioned] is the so-called ring with a stage of a gas-tight method, and it is constituted so that the seal of the gas may be carried out by the mating face 15.

[0024] In this example, like the 1st example of the above, it does not have abutment 10b to a ring 10, but since joint 15e of a ring 15 is the so-called gas-tight form with a stage, a rise of the lubricating oil which passes along joint 15e is intercepted. Thereby, the scattering prevention effectiveness of a lubricating oil is heightened rather than the thing of the 1st example. Other configurations are the same as that of the 1st example, and attach and show the same sign to the same member.

[0025]

[Effect of the Invention] Since according to this invention the ring which has the collision side where the lubricating oil through which it is run by reciprocation of a piston collides is attached in an upper part location and it consists of piston top dead centers of the inner skin of a cylinder liner, the lubricating oil to which climb motion was given by inertial force collides and falls on the inferior surface of tongue (collision side) of a ring, and scattering to a combustion chamber is prevented.

[0026] Moreover, since according to invention of claim 2 a ring is strongly attached in a ring groove by the elasticity of a spring while the seal of the abutment section of a ring is performed certainly, the rise by the side of the combustion chamber of a lubricating oil and the scattering prevention effectiveness serve as size further.

[0027] By this, infiltrate into a combustion chamber, and it burns, or the amount of the lubricating oil adhering to the wall surface of combustion chamber configuration members, such as cylinder cover and a piston, decreases sharply compared with the conventional thing, an improvement of specific lubricating oil consumption is made, and an engine's operation cost is reduced.

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 TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The behavior situation of the lubricating oil 06 at the time of a piston 03 being in a top dead center is shown in drawing 7 . The lubricating oil supplied to the inside of a cylinder liner 01 is stored in the top-land clearance 05 which is the space formed by the peripheral face of inner skin 01 of top-face [of the piston ring 04 of the maximum upper case], and cylinder liner 01 a, and a piston 03.

[0005] Although the above-mentioned piston 03 reciprocates the inside of a cylinder liner 01, acceleration:alpha the lubricating oil 06 which exists in the top-land clearance 05 is also indicated to be by the following formula by this is received.

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[0008] Therefore, the lubricating oil which disperses with the above-mentioned inertial force will be consumed vainly, and causes aggravation of specific lubricating oil consumption.

[0009] The purpose of this invention is preventing the rise to the direction of a combustion chamber of the lubricating oil supplied to cylinder liner inner skin, especially the lubricating oil in top-land clearance, and reducing specific lubricating oil consumption.

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MEANS

[Means for Solving the Problem] The 1st means made into the summary of this invention is having attached the ring which has the collision side where the lubricating oil through which establishes a ring groove in an upper part location, and it is run by reciprocation of a piston rather than the piston top dead center of the inner skin of a cylinder liner collides in the above-mentioned ring groove.

[0011] Moreover, the 2nd means is having divided the above-mentioned ring into the circumferencial direction at plurality, and having attached in the ring groove with the tension of a spring.

[0012] In addition, the distance (clearance) with a piston-top surface [in / on the above-mentioned ring and / the collision side, i.e., the inferior surface of tongue of a ring and a top dead center,] is the range which does not cause trouble to the reciprocating motion of a piston. It takes as small as possible, and as for the inner skin of a ring, it is more desirable than the peripheral face of the piston upper part to bring near by movement of the combustion and piston, and exhaust valve in a combustion chamber inside in the range which does not cause trouble, and to fully take the lap section of a piston and a ring, when preventing a rise of a lubricating oil.

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OPERATION

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EXAMPLE

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[0020] The inertial force which acts on the lubricating oil 6 stored in the top-land clearance 5 by which partition formation was carried out at the piston ring 4, the cylinder liner 1, and piston 3 of the maximum upper case at the time of operation of the internal combustion engine having the cylinder liner constituted as mentioned above serves as max at the time of the top dead center of a piston 3. For this reason, although this lubricating oil 6 tends to disperse to a combustion chamber 9, it collides with the inferior surface of tongue 10 of the ring 10 fitted in in ring groove 1b of a cylinder liner 1, and scattering can be prevented. by this, it infiltrates into a combustion chamber 9 and evaporates with a flame, and the lubricating oil consumed vainly is boiled markedly and decrease in number.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The liner axial center line near the cylinder liner upper part of the internal combustion engine concerning the 1st example of this invention, and the meeting sectional view.

[Drawing 2] The II-II view Fig. of drawing 1 .

[Drawing 3] The drawing 1 adaptation Fig. concerning the 2nd example of this invention.

[Drawing 4] The IV-IV view Fig. of drawing 3 .

[Drawing 5] The V-V expanded sectional view of drawing 3 .

[Drawing 6] The sectional view which meets the liner axial center line near an internal combustion engine's cylinder liner upper part.

[Drawing 7] The sectional view showing the behavior situation of a lubricating oil [/ near the cylinder liner upper part].

[Description of Notations]

1 Cylinder Liner

1a Inner skin of a cylinder liner

1b Ring groove

3 Piston

4 Piston Ring

5 Top-Land Clearance

9 Combustion Chamber

10 15 Ring

10a Collision side

10b Abutment

16 Coil Spring

[Translation done.]

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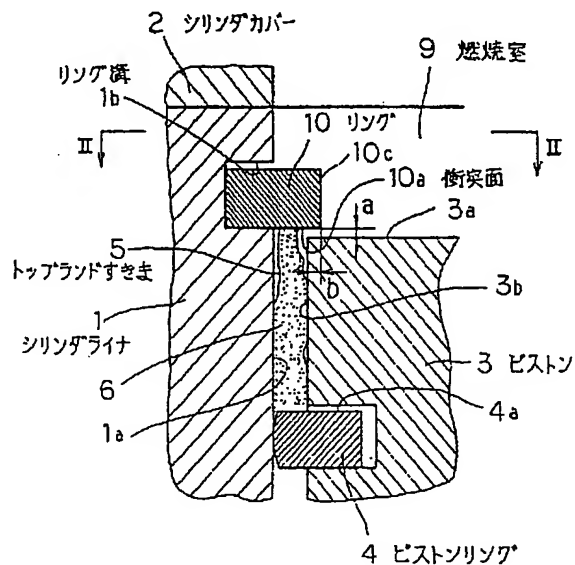
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		(74)代理人	弁理士 坂間 暁 (外1名)

(54) 【発明の名称】 シリンダライナ

(57) 【要約】

【目的】 シリンダライナ内周面に供給される潤滑油、特にトップランドすきま内の潤滑油の燃焼室方向への上昇を防止して潤滑油消費率を低減する。

【構成】 往復動機関用シリンダライナにおいて、上記シリンダライナのピストンリングが摺接する内周面のピストン上死点よりも上方位置にリング溝を設け、ピストンの往復動により掻き上げられる潤滑油が衝突する衝突面を有するリングを上記リング溝内に装着し、慣性力により上昇しようとする潤滑油を上記リングに衝突させ、落下せしめる。



【特許請求の範囲】

【請求項 1】 往復動機関用シリンダライナにおいて、上記シリンダライナのピストンリングが摺接する内周面のピストン上死点よりも上方位置にリング溝を設け、ピストンの往復動により掻き上げられる潤滑油が衝突する衝突面を有するリングを上記リング溝内に装着したことを特徴とするシリンダライナ。

【請求項 2】 上記リングが、円周方向に複数個に分割され、スプリングにより上記リング溝内に嵌着されてなる請求項 1 記載のシリンダライナ。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は内燃機関、往復動圧縮機等の往復動機関に使用されるシリンダライナに関する。

【0002】

【従来の技術】 図 6 には往復動内燃機関の燃焼室廻りの断面図が示されている。図において 01 はシリンダライナ、02 はシリンダカバー、020 は排気弁、03 はシリンダライナ 01 内を往復動するピストンであり、同ピストン 03 の外周には燃焼室 09 内の燃焼ガスをシール 20 するため、複数本（この例では 4 本）のピストンリング

$$\alpha = r \omega^2 \{ \cos \theta + (\cos 2 \theta) / \lambda \} \dots \dots \dots (1)$$

ここで、 θ : クランク角度、

r : クランク半径、

ω : 角速度、

λ : 連かん比。

【0007】 上記加速度： α は上死点において上向きに最大となるため、トップランド 05 内の潤滑油 06 はこの加速度： α による慣性力によって燃焼室 09 内へ飛散し、ピストンの上面 03a、シリンダカバー 02、シリンダライナ 01 のピストンリング 04 と摺接しない内周面等に付着して、本来の目的であるシリンダライナ 01 とピストンリング 04 の摺動部の潤滑に使用されなくなるのみならず、燃焼時に発生する火炎によって蒸発せしめられる。

【0008】 従って、上記慣性力によって飛散する潤滑油は無駄に消費されることとなり、潤滑油消費率の悪化の要因となる。

【0009】 本発明の目的は、シリンダライナ内周面に供給される潤滑油、特にトップランドすきま内の潤滑油の燃焼室方向への上昇を防止して潤滑油消費率を低減することである。

【0010】

【課題を解決するための手段】 本発明の要旨とする第 1 の手段は、シリンダライナの内周面のピストン上死点よりも上方位置にリング溝を設け、ピストンの往復動により掻き上げられる潤滑油が衝突する衝突面を有するリングを上記リング溝内に嵌着したことである。

【0011】 また第 2 の手段は、上記リングを円周方向に複数個に分割し、スプリングの張力によりリング溝内

04 が嵌着されている。

【0003】 上記ピストンリング 04 及びこれと摺接するシリンダライナ 01 の内周面（摺動面）01a には、シリンダライナ 01 に穿設された注油孔（図示せず）あるいははねかけ給油により潤滑油が供給され、ピストンリング 04 の焼付きを防止するとともに、ピストンリング 04 及びシリンダライナ 01 の摺動面 01a の摩擦を低減している。

【0004】

10 【発明が解決しようとする課題】 図 7 には、ピストン 03 が上死点にある際の潤滑油 06 の挙動状況が示されている。シリンダライナ 01 の内面に供給された潤滑油は、最上段のピストンリング 04 の上面、シリンダライナ 01 の内周面 01a およびピストン 03 の外周面とで形成された空間であるトップランドすきま 05 に蓄えられる。

【0005】 上記ピストン 03 はシリンダライナ 01 内を往復運動するが、これにより、トップランドすきま 05 に存在する潤滑油 06 も次の式で示される加速度： α を受ける。

【0006】

に嵌着したことである。

【0012】 尚、上記リングにおいて、その衝突面つまりリングの下面と上死点におけるピストン頂面との距離（隙間）はピストンの往復運動に支障を来たさない範囲で、できるだけ小さく採り、また、リングの内周面はピストン上部の外周面よりも、燃焼室における燃焼及びピストンや排気弁の運動に支障を来たさない範囲で内側へ寄せ、ピストンとリングとのラップ部を充分にとるのが、潤滑油の上昇を防止するうえで好ましい。

【0013】

【作用】 本発明は上記のように構成されているので、ピストン上死点近傍において、ピストンの上向きの慣性力に伴いトップランドすきま間の潤滑油は上昇運動を附与されるが、この潤滑油はリングの下面即ち衝突面に衝突して落下し、燃焼室内への飛散が阻止される。

【0014】 また上記第 2 の手段によれば、リングの合い口部のシールが確実に行われるとともに、リングはスプリングの弾力によりリング溝内に堅固に嵌着されるので、さらに高い潤滑油の上昇、飛散防止効果が得られる。

【0015】

【実施例】 以下図面を参照して本発明の実施例を詳細に説明する。図 1 には本発明の第 1 実施例に係る内燃機関のシリンダライナ上部近傍の拡大断面図が、図 2 には図 1 の II-II 矢視図が夫々示されている。

【0016】 図 1、2 において、1 はシリンダライナ、2 はシリンダカバー、3 はシリンダライナ 1 の内周面 1a 上を往復動するピストン、4 は同ピストン 3 の外周に

複数本装着されたピストンリング、9は燃焼室、5はシリンダライナ1の内周面1aとピストン3の上部外周面3bと第1段ピストンリング4の上面4aとにより区画形成されるトップランドすきまである。

【0017】10はシリンダライナ1の内周面1aに形成されたリング溝1b内に装着されたリングである。このリング10は、ピストン3がその上死点で停止する位置におけるピストン頂面3aと接触しない位置に設けられたシリンダライナ1のリング溝1b内に装着される。

【0018】即ち上記リング10はこれの下面（衝突面）10aと、ピストン3の上死点位置におけるピストン頂面3aとの隙間aをピストン3の往復運動に支障のない範囲で小さく採るとともに、その内周面10cとピストンの外周面3bとのラップ量bを燃焼室9における燃焼、ピストン3及び給気弁、排気弁の運動に支障を来たさない範囲で大きく採るように構成する。

【0019】上記リング10は円環に1ヶ所の合い口すきま10bを設けた一体構造であるため図2に示されるように、これをリング溝1a内に取付け、取外しを行う場合には、合い口すきま10bを縮める方向に力を加えて内径を小さくする必要がある。このためリング10の上面に凹部10dを設け、この凹部10dに治具を挿入可能としている。

【0020】上記のように構成されたシリンダライナを備えた内燃機関の運転時において、最上段のピストンリング4、シリンダライナ1およびピストン3とで区画形成されたトップランドすきま5に貯えられた潤滑油6に作用する慣性力は、ピストン3の上死点時において最大となる。このため、同潤滑油6は燃焼室9へと飛散しようとするが、シリンダライナ1のリング溝1b内に嵌装されたリング10の下面10に衝突して飛散が防げられる。これにより、燃焼室9へ浸入して火炎により蒸発し、無駄に消費される潤滑油は格段に減少する。

【0021】図3～図5には本発明の第2実施例が示されている。この実施例においては、リングとして円周方向に3分割された分割型のリング15を用い、これをコイルスプリング16によりシリンダライナ1のリング溝16内に嵌着している。

【0022】即ち図3～図5において、15は円周方向に3分割された（2分割でも4分割以上でもよい）リングであり、シリンダライナ1の内周面1aに刻設されたリング溝1b内に嵌着されている。16はコイルスプリングであり、上記リング15の内周面に円周方向に沿って設けられた嵌合溝15f内に嵌着され、その外向きの弾力（張り力）によりリング15をリング溝1bの底面に押し付けている。

【0023】上記3分割されたリング15の3ヶ所の接合部15eは、図5に示されるように、いわゆるガスタイト方式の段付きリングであり、合わせ面15にてガス

をシールするように構成されている。

【0024】この実施例においては、上記第1実施例のように、リング10に合い口10bを有さず、リング15の接合部15eは段付きのいわゆるガスタイト型式であるので、接合部15eを通っての潤滑油の上昇は遮断される。これにより、第1実施例のものよりも潤滑油の飛散防止効果が高められる。その他の構成は第1実施例と同様であり、同一の部材には同一の符号を付して示す。

【0025】

【発明の効果】本発明によれば、シリンダライナの内周面のピストン上死点よりも上方位置に、ピストンの往復運動により掻き上げられる潤滑油が衝突する衝突面を有するリングを嵌着して構成されているので、慣性力により上昇運動を付与された潤滑油はリングの下面（衝突面）に衝突して落下し、燃焼室への飛散が阻止される。

【0026】また請求項2の発明によれば、リングの合い口部のシールが確実に行われるとともに、リングはスプリングの弾力により堅固にリング溝に嵌着されるので、潤滑油の燃焼室側への上昇、飛散防止効果がさらに大となる。

【0027】これにより、燃焼室へ浸入して燃焼したり、シリンダカバー、ピストン等の燃焼室構成部材の壁面に付着する潤滑油の量が従来のものに較べて激減し、潤滑油消費率の改善がなされ、機関の稼働コストが低減される。

【図面の簡単な説明】

【図1】本発明の第1実施例に係る内燃機関のシリンダライナ上部近傍のライナ軸心線と沿う断面図。

【図2】図1のII-II矢視図。

【図3】本発明の第2実施例に係る図1応当図。

【図4】図3のIV-IV矢視図。

【図5】図3のV-V拡大断面図。

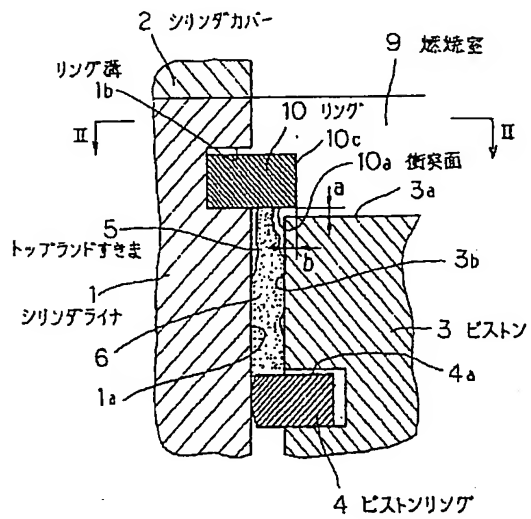
【図6】内燃機関のシリンダライナ上部近傍のライナ軸心線に沿う断面図。

【図7】シリンダライナ上部近傍における潤滑油の挙動状況を示す断面図。

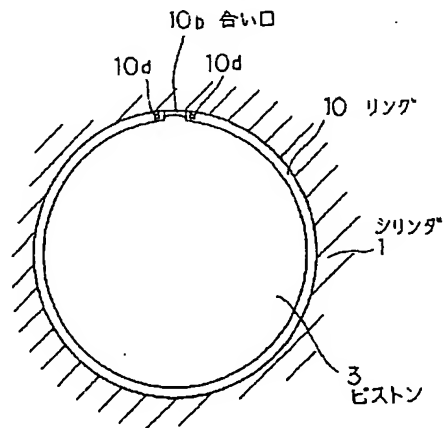
【符号の説明】

1	シリンダライナ
1 a	シリンダライナの内周面
1 b	リング溝
3	ピストン
4	ピストンリング
5	トップランドすきま
9	燃焼室
10, 1.5	リング
10 a	衝突面
10 b	合い口
16	コイルスプリング

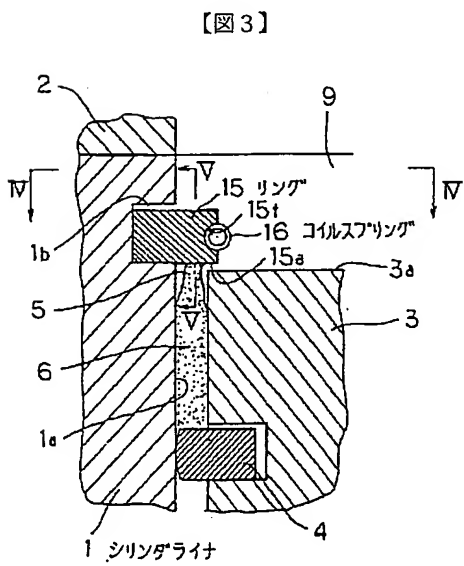
【図1】



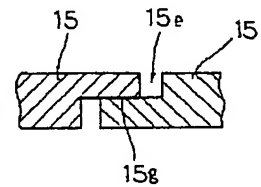
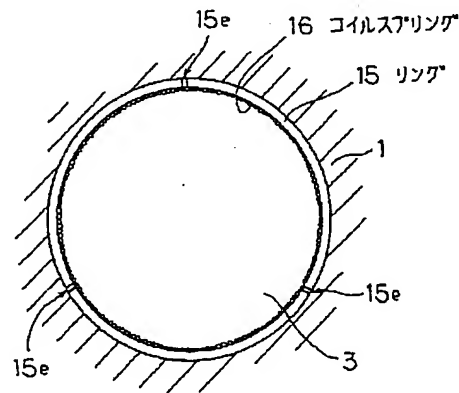
【図2】



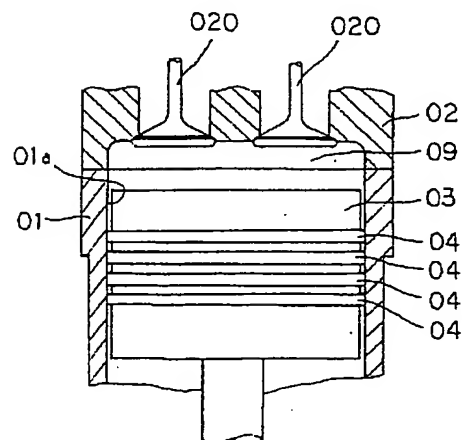
【図3】



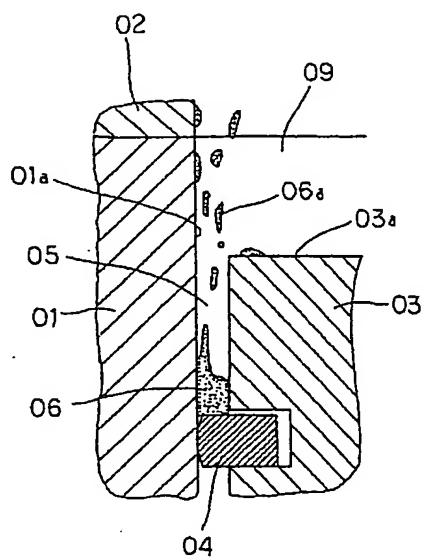
【図4】



【図6】



【図7】



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